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Subject: 430. Gas Processing Facilities.

430. Gas Processing Facilities

- Operations.

Wells served notifications: This will work until a field gets complex with more than one facility able to serve different areas. Frenchie Draw is an example of that.

Processing facility locations: This is a very tricky one. Some well sites run JT Plants with product tanks for un-stabilized condensates so that they can meet flare emission regulations. They flare because there is no midstream gathering in place. That means one well served unless multiple wells close by are tied in because there is no gathering system or they are drilling horizontally for a multi-well pod.

Gas processing normally means the separation of natural gas components (C1 through C10) into separate products, either liquid or gas, via refrigeration methods or others. Gas *treating* is normally done upstream of the plant, but can be on the plant site. Gas processing *systems* include the compression for inlet, refrigeration, overheads boosting, and sales gas boosting. It could also include the EG system for hydrate control, Hot Oil systems, Instrument air systems, and drain and flare systems. A gas processing facility will be designed to ANSI B31.3 code, and this includes everything within the plant fence. Exceptions for non-code areas, such as offices, shops, truck scale areas, etc., must be shown on the permit Plot Plan and approved in the HAZOP review. All pressure vessels will be designed to meet ASME Section VIII of the National Boiler Code, and have their U1a forms (birth certificates) on file with the national board and copies on site, with final-issue code drawings (see documentation).

Gas treating is what is done to remove those pesky contaminants (on the chart), so you have dehydration (TEG) for water removal, amine (DGA, MDEA, others) for CO₂ and H₂S removal, nitrogen rejection plants, oxygen removal, etc.

The **by-products** of treating, thus, are water, CO₂, H₂S, nitrogen, and oxygen, if you consider just the samples above.

-Water is given off as steam or condensed.

-CO₂ is removed and collected, and either discharged, liquefied, or re-injected, depending many factors.

-H₂S is dealt with by quantity, and either converted to sulfur or re-injected into a formation.

Nitrogen and oxygen can be either vented or collected for sale.

Gas operations that are handled *on a well lease*, which normally include compression, dehydration, fuel gas conditioning, and oxygen removal, are 'upstream' of midstream. *A JT plant on a well lease is a very tricky operation, as it includes bulk flammable liquids (storage tank) over the OSHA threshold and truck loading of a natural gas liquid. NFPA 58 needs to be assessed for Idaho and if not in effect, planned for. Truck product loading for over-the-road trucks must comply with DOT rules that interface with NAPA 58, ANSI, and API.*

Assessing what Idaho will call a PSM facility needs to be established and well-defined based on OSHA regulations.

Plant Safety: *(It's up to you to determine how far you will take safety oversight- good for public opinion to be strict, as the local's sons and daughters may be working the field and plant)*

PSM facilities must be equipped per OSHA guidelines *and industry standards* for emergency and safety equipment. A posted Safety Equipment Map (Site Plan based on Plot Plan) must be located and visible in the main office entryway to show workers and visitors pertinent information needed for an on-site safety training program. It must include all safety and medical response equipment, gas or other monitors, wind sock location, alarm sounds, fence gates, emergency shut-down mushroom buttons, evacuation plan routes, and any other data pertinent to personnel safety on site. If storage and loading systems are present, these must be included. If there is on-site pig stations (rare), these should be included.

Plant signage can be addressed here, as are all MSDS display sticker standards. Different levels of each can be employed.

Dikes and plant drainage should be addressed on the permit Plot Plan and review in HAZOP. The state can request a representative be present for HAZOP reviews as part of the permitting/oversight process.

Site access and security issues. Site monitoring Cameras, truck loading cameras, wind sock data, etc. Fence security and access issues for safety personnel. Plant shut-down mushroom button locations, especially @ evacuation gates.

*Plant **main sign** data. Lots of stuff to be included.*

- **Meters and Facility Plans.**

Gas Processing Facilities must account for all gas and liquids entering and leaving the site. The first measure is with metering. The second check-system is performing plant balances -everything has to be somewhere rule. Thus unaccounted losses must be established (*fugitive emissions*), and may come from such areas as meter bypass valve leaks, valve packing leaks, flange and union leaks, drain and PSV leaks, along with gas absorption by treating and dehydration chemicals. (It's up to the state to require loss accountability search results and repairs if necessary). Some metering inaccuracy is possible and normal- thus the re-calibrations necessary. Normal gas stream '*shrinkage*' included liquids made and fuel gas used, either for engines (compressors, generators, etc.), burners, or instrument gas. Some plants return a 'lease fuel' back to the well sites. All of these are metered and monitored so that system operations can be monitored and anomalies can be detected.

PFDs, P&IDs and Plot Plans must be submitted for permitting (have been for AM), and these can be referenced for metering logic and controls. Meters are 'proved' and calibrated by 3rd party companies on a schedule defined by _____. Supervisory systems must be described in the HAZOP reviews for all operator interfaces, functions, automatic emergency reactions, and over-rides (Control Logic or Cause and Effect documents).

We need to look at you midstream permitting process- the whole she-bang.

Normal gas processing of treated gas produces no waste by-products. It's either sales gas or liquid product.

The TEG or EG system removes water, and the glycol is filter for impurities and the filters are disposed of per regulations. (Not much different than a fuel filter for a car- just bigger)

Selected meters required for plant balances will be set up for supervisory control and data acquisition as noted on the P&IDs and control logic permit application diagrams. Supervisory control operations and personnel roles and methods must be covered in a HAZOP review and approved by the state. On-site operation rooms must be defined and permitted with plant permit proposal.

- **Flaring.**

There are planned and non-planned uses of the flare:

1. Planned: During normal maintenance routines, such as PSV testing, small blow-downs for start-up or maintenance, and such. (notices)
2. Planned: During non-normal but non-emergency situations, such as system or plant blow-downs.
3. For up-steam operations (wells) to keep working without having to shut down or flare on leases. Usually if the plant is down for some reason) (60 days)
4. During emergency blow-downs, instigated by automation response or operator reactions.

Flaring operations are part of the written procedures.

Flare metering is normally not done, at least in my experience. Flare Knock-out drum liquids to drain are not metered.

- **Inspections.**

What state inspectors inspect: (per you)

1. **Plant books**- can either be electronic or hard copy, but must be plant specific in nature and filed for easy reference. State can mandate that hard copy must be in plant office and back-up copies be elsewhere (you choose).

Plant books (digital or *hard*) to include:

- a. *All permit Flowsheet & P&ID documentation- as-built and up to date*
- b. *Plots Plans and Safety Maps- as-built and up to date*
- c. *Pressure vessel drawings with U1a forms for each.*
- d. Operations manuals or links to sites for them.
- e. Electrical schematics
- f. Control Logic, or Cause and Effect diagram
- g. MOC records (Management of Change)

2. **Plant Records-**

- a. *Meter log-books (current practices evaluated/applied)*
- b. *Operator training logs*
- c. *HAZOP log*
- d. *Relief valve pressure-test/leak-test log*
- e. *Visitor/contractor training manual*
- f. *Accident logs*
- g. *Upset condition logs- flaring*

3. **Plant Personnel-**

- a. Plant operator credentials
- b. Conduct operator operations/process/safety knowledge test (to devise, but HAZOP review will contain most needed)
- c. Control room equipment proficiency
- d. Safety equipment, hands-training and efficiency

4. **Plant Inspection-**

- a. Plant condition matches Plot Plan and MOC records
- b. Safety equipment in place and operational
- c. Medical/first aid equipment kept up.
- d. Plant signage proper and complete to regulations
- e. General housekeeping
- f. Misc.

• **Reporting.**

- 1. Receipts, processing, and accounting for all gas and liquids
- 2. Inspection correction reports
- 3. Accidents or upsets
- 4. Spills and clean-up measures